invention described in the specification. The amendments to Claims 3-4, 26-28 and 30-32 are made due to the cancellation of former Claims 2 and 25 from which the amended claims formerly depended. New Claims 78 - 83 and amended Claims 3-4, 26-28 and 30-32 are not added to overcome the rejections or to comply with any statutory requirement for patentability contained in the First Office Action, but only to claim certain embodiments of the invention which are described in the specification. The support for the amendment of Claims 1, 22 and 77 is found in former Claim 21, Page 14, Lines 4-5, 8-9, Page 46, Lines 2-4, Page 47, Lines 10-12. The support for new Claims 78 - 80 can be found at Page 9, Lines 5-14. The support for new Claim 81 is found in original Claim 1 and at Page 8, Lines 24-26. The support for new Claims 82 and 83 is found at Page 14, Lines 6-7.

In the Office Action, the Examiner made the following rejections:

Claims 1 - 77 were rejected under 35 U.S.C. §112 as being indefinite;

Claims 1, 2, 16, 17, 19, 21, 22, 24-26, 30, 32, 65, 68, 70, 71, 72, and 77 were rejected under 35 U.S.C §102 as being anticipated by U.S. 5,294,353 to Dill ("Dill");

Claims 1, 16, 17, 22, 24, 65, 66 and 77 were rejected under 35 U.S.C §102 as being anticipated by U.S. 3,804,760 to Darley ("Darley").

As claimed in Claim 1 and the claims that depend therefrom, the Applicant's invention includes:

> Claim 1. A method for enhancing the stability of a solids-stabilized water-in-oil emulsion, said method comprising the step of ***pretreating at least a portion of said oil prior to emulsification***, said pretreating step comprising at least one of the steps of ***adding dilute*** mineral ***acid*** or acetic acid ***to said oil***, adding a lignosulfonate to said oil, sulfonating said oil, thermally treating said oil in an inert environment and thermally oxidizing said oil, wherein the severity of said thermal treatment of said oil is sufficient to reduce the viscosity of said solids-stabilized water-in-oil emulsion as compared to the viscosity of a solids-stabilized water-in-oil emulsion made with oil that has not been pretreated.

The applicant's invention, as claimed in Claim 1, therefore is a method of pretreating at least a portion of the oil prior to emulsification. Claim 22 contains the same first emphasized language above while Claim 77 contains the pretreatment reference only. The aspect of the invention which includes using dilute acid in the pretreatment step, includes adding the dilute acid to the oil. Claims 22 and 77 contain the same second emphasized language above.

The Examiner asserts that the Applicant's invention, as claimed in independent Claims 1, 22 and 77, is anticipated by Dill because, among other things, the Examiner asserts that "an acid and silica are added to the oil, prior to emulsification (see example 1)" in Dill. However, Dill describes adding an acid to the water component to be used in forming the emulsion not the oil component to be used in forming the emulsion. Dill describes the following in the Summary of the Invention section at Column 2, Lines 8-16:

> The method... comprises... mixing a particulated silica compound with an aqueous liquid to form an aqueous slurry; mixing oil with a surface active agent... ***and then combining the aqueous slurry and the oil-surface active agent mixture to form a stable oil external-aqueous internal emulsion***.

Dill states that the aqueous liquid can be an aqueous acid solution. *See* Col. 3, Ln 29-31. Examples 1 and 2 of Dill describe the use of a 10% aqueous hydrochloric acid solution as the aqueous acid phase. *See* Col. 5, ln 59-61 & Col. 6, Ln 62-64. Therefore, it is clear that Dill adds acid to the water component to be used in the formation of an emulsion and not the oil phase to be used in the emulsion. The aqueous acid phase is therefore not combined with the oil phase until the emulsion is formed. Therefore, Dill does not teach a method of pretreating at least a portion of the oil using dilute acid prior to emulsification as claimed in Claims 1 and 22 and the claims that depend therefrom nor pretreating the oil with a dilute acid as claimed in Claim 77 of the Applicant's invention.

The Examiner also asserts that the Applicant's invention, as claimed in independent Claims 1, 22 and 77, is anticipated by Dill and Darley because the

Examiner asserts that both references use either diesel and/or kerosene as the oil component of the emulsion and "Diesel and kerosene oil are thermally treated, since they are formed from distillation of crude which is thermally treated at temperatures within the scope of the present invention."

Claims 1, 22 and 77, as amended, state that the severity of the thermal treatment of the oil is sufficient to reduce the viscosity of the solids-stabilized water-in-oil emulsion as compared to the viscosity of a solids-stabilized water-in-oil emulsion made with oil that has not been pretreated. Neither Dill nor Darley teaches or suggests thermally treating any portion of the oil component of the emulsion at conditions sufficient to reduce the viscosity of the resulting emulsion made from a thermally treated oil component.

The Examiner has objected to Claims 1, 22 and 77 under §112 as indefinite and stated that "it is not clear if a one degree change in temperature would be considered thermal heating or if just exposure to air is considered oxidizing." The Applicants believe that the claims and specification of the current application adequately specify sufficient conditions for thermal treating and thermal oxidizing and that the claims are therefore sufficiently definite. In addition and with regard to the thermal treatment aspect of the invention only, the amended language added to Claims 1, 22 and 77 requires a certain severity of thermal treatment sufficient to reduce the viscosity of the solids-stabilized water-in-oil emulsion as compared to the viscosity of a solids-stabilized water-in-oil emulsion made with oil that has not been pretreated. The amendment of Claims 1, 22 and 77 also addresses the §112 objection to former Claim 21. With regard to the §112 objection to Claim 74, Claim 74 specifies that the duration of aging is sufficient to reduce the viscosity of the emulsion and therefore provides sufficient definiteness to the claim.

The application is believed to be in condition for allowance. Applicants believe that the prior art does not teach or suggest, either alone or in combination, all the elements of independent Claims 1, 22, 77 and 81. The dependent claims are also believed patentable since they depend on independent Claims 1 and 22 for the reasons discussed above. Therefore, it is not believed necessary to discuss the Examiner's specific §102 rejections of the dependent claims. Applicants therefore respectfully request that this application be allowed and passed to issue.

If Examiner wishes to discuss this application with counsel, please contact the undersigned.

Respectfully submitted,

Date: 4/7/03

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Claim Amendments

We claim:

1. (currently amended) A method for enhancing the stability of a solids-stabilized water-in-oil emulsion, said method comprising the step of pretreating at least a portion of said oil prior to emulsification, said pretreating step comprising at least one of the steps of adding dilute mineral acid or acetic acid to said oil, adding a lignosulfonate to said oil, sulfonating said oil, thermally treating said oil in an inert environment and thermally oxidizing said oil, wherein the severity of said thermal treatment of said oil is sufficient to reduce the viscosity of said solids-stabilized water-in-oil emulsion as compared to the viscosity of a solids-stabilized water-in-oil emulsion made with oil that has not been pretreated.

2. (canceled) ~~The method of claim 1, wherein said pretreating step comprises adding dilute acid to at least a portion of said oil prior to emulsification, said dilute acid selected from the group consisting of mineral acids, organic acids, mixtures of at least two mineral acids, mixtures of at least two organic acids, and mixtures of at least one mineral acid and at least one organic acid~~.

3. (currently amended) The method of claim 1~~2~~, wherein said acid is added to said oil at a rate of from about 8 parts per million to about 30,000 parts per million.

4. (currently amended) The method of claim 3~~2~~, wherein said method further comprises the steps of determining the pH of said water-in-oil emulsion following emulsification and if necessary adjusting said pH so that it falls in the range of from about 5.0 to about 7.0.

5. (original) The method of claim 4, wherein said pH of said water-in-oil emulsion is adjusted by adding ammonium hydroxide to said emulsion.

6. (original) The method of claim 1, wherein said pretreating step comprises sulfonating at least a portion of said oil prior to emulsification.

7. (original) The method of claim 6, wherein said step of sulfonating said oil comprises the addition of at least one sulfonating agent to said oil.

8. (original) The method of claim 7, wherein said sulfonating agent is added to said oil at a rate of between about 0.5wt% to about 5wt%.

9. (original) The method of claim 1, wherein said pretreating step comprises adding a lignosulfonate additive to at least a portion of said oil prior to emulsification.

10. (original) The method of claim 9, wherein said lignosulfonate additive is added to said oil at a rate of between about 500 parts per million to about 5000 parts per million.

11. (original) The method of claim 9 wherein said lignosulfonate additive is oil soluble.

12. (original) The method of claim 9 wherein said lignosulfonate additive is water soluble.

13. (original) The method of claim 1, wherein said pretreating step comprises thermally oxidizing at least a portion of said oil prior to emulsification.

14. (original) The method of claim 13, wherein said thermal oxidation step is at a temperature of between about 110°C to about 180°C.

15. (original) The method of claim 13, wherein said thermal oxidization step is enhanced by addition of a catalyst.

16. (original) The method of claim 1, wherein said pretreatment step comprises thermally treating at least a portion of said oil in an inert environment prior to emulsification.

17. (original) The method of claim 16, wherein said thermal treatment step is at a temperature in a range of between about 250°C to about 450 °C.

18. (original) The method of claim 16, wherein said thermal treatment step is at a pressure in the range of between about 30 psi to about 300 psi.

19. (original) The method of claim 16, further comprising the addition of dilute acid to said oil prior to emulsification, said dilute acid selected from the group consisting of mineral acids, organic acids, mixtures of at least two mineral acids, mixtures of at least two organic acids, and mixtures of at least one mineral acid and at least one organic acid.

20. (original) The method of claim 16, further comprising the addition of a lignosulfonate additive to said oil prior to emulsification.

21. (cancelled) ~~The method of claim 16, wherein said pretreatment step reduces the viscosity of said solids-stabilized water-in-oil emulsion.~~

22. (currently amended) A method for recovering hydrocarbons from a subterranean formation, said method comprising the steps of:

a) preparing a solids-stabilized water-in-oil emulsion by

(1) pretreating at least a portion of said oil prior to emulsification, said pretreating step comprising at least one of the steps of adding dilute acid to said oil, adding a lignosulfonate additive to said oil, sulfonating said oil, thermally treating said oil in an inert environment and thermally oxidizing said oil, wherein the severity of said thermal treatment of said oil is sufficient to reduce the viscosity of said solids-stabilized water-in-oil emulsion as compared to the viscosity of a solids-stabilized water-in-oil emulsion made with oil that has not been pretreated;

(2) adding solid particles to said oil prior to emulsification; and

(3) adding water and mixing until said solids-stabilized water-in-oil emulsion is formed;

b) injecting said solids-stabilized water-in-oil emulsion into said subterranean formation; and

c) recovering hydrocarbons from said subterranean formation.

23. (original) The method of claim 22, wherein said solids-stabilized water-in-oil emulsion is used as a drive fluid to displace hydrocarbons in said subterranean formation.

24 (original) The method of claim 22, wherein said solids-stabilized water-in-oil emulsion is used as a barrier fluid to divert the flow of hydrocarbons in said subterranean formation.

25 (canceled) ~~The method of claim 22, wherein said pretreating step comprises adding dilute acid to at least a portion of said oil prior to emulsification, said dilute acid selected from the group consisting of mineral acids, organic acids, mixtures of at least two mineral acids, mixtures of at least two organic acids, and mixtures of at least one mineral acid and at least one organic acid.~~

26 (currently amended) The method of claim 22~~25~~, wherein said solid particles are hydrophobic solid particles.

27 (currently amended) The method of claim 26~~25~~, wherein said dilute acid is added at a treat rate of between about 8 parts per million to about 30,000 parts per million.

28 (currently amended) The method of claim 22~~25~~, further comprising the steps of determining the pH of said water-in-oil emulsion following emulsification, and if necessary adjusting said pH so that it falls in the range of from about 5.0 to about 7.0.

29 (original) The method of claim 28, wherein said pH of said water-in-oil emulsion is adjusted by adding ammonium hydroxide to said emulsion.

30 (currently amended) The method of claim 22~~25~~, wherein said step of adding solid particles to said oil occurs after said step of adding dilute acid to said oil.

31 (currently amended) The method of claim 22~~25~~, wherein said step of adding solid particles to said oil occurs before said step of adding said dilute acid to said oil.

32 (currently amended) The method of claim 22~~25~~, wherein said solid particles are added at a treat rate of about .05 wt% to about 0.25 wt% based on the weight of the oil.

33. (original) The method of claim 22, wherein said pretreating step comprises sulfonating at least a portion of said oil prior to emulsification.

(original)

34. The method of claim 33, wherein said step of sulfonating said portion of oil comprises the addition of at least one sulfonating agent to said oil.

35. (original) The method of claim 34, wherein said sulfonating agent is sulfuric acid.

36. (original) The method of claim 34, wherein said sulfonating agent is added to said oil at a treat rate of from about 0.5wt% to about 5wt%.

37. (original) The method of claim 33, wherein said solid particles comprise hydrophobic solid particles.

38. (original) The method of claim 33, wherein said solid particles comprise functionalized asphalts.

39. (original) The method of claim 33, wherein said solid particles comprise unfunctionalized asphalts.

40. (original) The method of claim 33, wherein said step of adding solid particles to said oil occurs after said sulfonation step.

41. (original) The method of claim 33, wherein said step of adding solid particles to said oil occurs before said sulfonation step.

42. (original) The method of claim 33, wherein said solid particles are added at a treat rate of about .05 wt% to about 2.0 wt% based on the weight of the oil.

43. (original) The method of claim 22, wherein said pretreating step comprises adding a lignosulfonate additive to at least a portion of said oil prior to emulsification.

44. (original) The method of claim 43, wherein said lignosulfonate additive is added to said oil at a treat rate of between about 500 parts per million to about 5000 parts per million.

45. (original) The method of claim 43, wherein said solid particles comprise hydrophobic solid particles.

46 (original) The method of claim 45, wherein said lignosulfonate additive comprises at least one water soluble lignosulfonate additive.

47 (original) The method of claim 43, wherein said solid particles comprise hydrophilic solid particles.

48. (original) The method of claim 47, wherein said lignosulfonate additive comprises at least one oil soluble lignosulfonate additive.

49 (original) The method of claim 43, wherein said step of adding solid particles to said oil occurs before said step of adding said lignosulfonate additive to said oil.

50. (original) The method of claim 43, wherein said step of adding solid particles to said oil occurs after said step of adding said lignosulfonate additive to said oil.

51 (original) The method of claim 43, wherein said solid particles are combined with said lignosulfonate additive, and then said combination is added to said oil before said emulsification.

52. (original) The method of claim 43, wherein said solid particles are added at a treat rate of about .05 wt% to about 0.25 wt% based on the weight of the oil.

53 (original) The method of claim 22, wherein said pretreating step comprises thermally oxidizing at least a portion of said oil prior to emulsification.

54. (original) The method of claim 53, wherein said oil is thermally oxidized at a temperature of between about 110°C to about 180 °C.

55 (original) The method of claim 53, wherein said thermal oxidation step is enhanced by addition of a catalyst.

56 (original) The method of claim 53, wherein said solid particles are hydrophobic solid particles.

57. (original) The method of claim 53, wherein said solid particles are hydrophilic solid particles.

58. (original) The method of claim 53, wherein said solid particles are bentonite clay.

59. (original) The method of claim 53, wherein said solid particles are added to said oil before said thermal oxidation step.

60. (original) The method of claim 53, wherein said solid particles are added to said oil after said thermal oxidation step, and before said emulsification.

61. (original) The method of claim 53, wherein said solid particles are added as a gel comprised of solid particles and water.

62. (original) The method of claim 61, wherein said solid particles comprise about 1.0 wt% to about 30 wt% of said gel based on the weight said water.

63. (original) The method of claim 61, wherein said gel is added to said oil in a treat range of about 5 wt% to about 95 wt% of said gel to said oil.

64. (original) The method of claim 53, wherein said solid particles are added to said oil at a treat rate of between about .05 wt% to about 5 wt% based on the weight of the oil.

65. (original) The method of claim 22, wherein said pretreatment step comprises thermally treating at least a portion of said oil in an inert environment prior to emulsification.

66. (original) The method of claim 65, wherein said oil is thermally treated at a temperature in the range of between about 250°C to about 450 °C.

67. (original) The method of claim 65, wherein said oil is treated at a pressure in the range of between about 30 psi to about 300 psi.

68. (original) The method of claim 65, wherein said solid particles are hydrophobic solid particles.

69. (original) The method of claim 65, wherein said solid particles are added to said oil before said thermal treatment step, and before said emulsification.

70. (original) The method of claim 65, wherein said solid particles are added to said oil after said thermal treatment step, and before said emulsification.

71. (original) The method of claim 65, wherein said solid particles are added at a treat rate of about .05 wt% to about 0.25 wt% based on the weight of the oil.

72. (original) The method of claim 65, wherein said step of thermally treating said oil further comprises the addition of dilute acid to said oil prior to emulsification, said dilute acid selected from the group consisting of mineral acids, organic acids, mixtures of at least two mineral acids, mixtures of at least two organic acids, and mixtures of at least one mineral acid and at least one organic acid.

73. (original) The method of claim 65, wherein said step of thermally treating said oil further comprises the addition of a lignosulfonate additive to said oil prior to emulsification.

74. (original) The method of claim 65, said method further comprising the step of aging said solids-stabilized water-in-oil emulsion following emulsification whereby the viscosity of said emulsion is reduced.

75. (original) The method of claim 74, wherein said step of aging said emulsion comprises centrifuging said emulsion at about 500 rpm to about 10,000 rpm for about 15 minutes to about 2 hours.

76. (original) The method of claim 75, wherein said step of centrifuging said emulsion is repeated.

77. (currently amended) A solids-stabilized water-in-oil emulsion for use in recovering hydrocarbons from a subterranean formation, said emulsion comprising

(a) oil, wherein at least a portion of said oil is pretreated by at least one of the steps of adding dilute <u>mineral acid or acetic</u> acid to said oil,

adding a lignosulfonate additive to said oil, sulfonating said oil, thermally treating said oil in an inert environment and thermally oxidizing said oil, wherein the severity of said thermal treatment of said oil is sufficient to reduce the viscosity of said solids-stabilized water-in-oil emulsion as compared to the viscosity of a solids-stabilized water-in-oil emulsion made with oil that has not been pretreated;

(b) water droplets suspended in said oil; and

(c) solid particles which are insoluble in said oil and said water at the conditions of said subterranean formation.

78. (New) The method of claim 1, wherein said oil is crude oil.

79. (New) The method of claim 22, wherein said oil is crude oil.

80. (New) The method of claim 77, wherein said oil is crude oil.

81. (New) A method for enhancing the stability of a solids-stabilized water-in-oil emulsion, said method comprising the step of pretreating at least a portion of said oil prior to emulsification, said pretreating step comprising at least one of the steps of adding dilute acid to said oil, adding a lignosulfonate to said oil, sulfonating said oil, thermally treating said oil in an inert environment and thermally oxidizing said oil, wherein said oil is crude oil that lacks adequate polar and asphaltene compounds to form stable solids-stabilized water-in-oil emulsions without oil pretreatment.

82. (New) The method of claim 4, wherein said acid is selected from the group consisting of sulfuric acid and hydrochloric acid.

83. (New) The method of claim 22, wherein said acid is selected from the group consisting of sulfuric acid and hydrochloric acid.